

**Design of a Microwave Frequency Sweep Interferometer
for plasma density measurements in ECR Ion Sources**

Giuseppe Torrì

*INFN - Laboratori Nazionali del Sud, Via S. Sofia 62, 95125 Catania, Italy
Università Mediterranea di Reggio Calabria, Reggio Calabria, Italy*

David Mascali, Riccardo Agnello, Giuseppe Castro, Luigi Celona, Lorenzo Neri, Dario Nicolosi,
Santi Passarello, Santo Gammìno,

INFN - Laboratori Nazionali del Sud, Via S. Sofia 62, 95125 Catania, Italy

Gino Sorbello

University of Catania, Catania, Italy; INFN-LNS, Catania, Italy

The Electron Cyclotron Resonance Ion Sources (ECRIS) development is strictly related to the availability of new diagnostic tools, nowadays consisting of only few types of devices designed for such compact machines. Microwave Interferometry is a non-invasive method for plasma diagnostics and represents the best candidate for plasma density measurement. Interferometry in ECR Ion Sources is a challenging task mainly due to their compact size. The typical density of ECR plasmas is in the range $10^{11} \div 10^{12} \text{ cm}^{-3}$ and it needs a probing beam wavelength of the order of few centimetres, comparable to the chamber radius. The paper describes the design of a new microwave interferometer developed at the LNS-INFN laboratories based on the so-called “frequency sweep” method to prevent the generation of “multipaths”, due to the modal behaviour of the microwaves and their reflections inside the cavity. In this work the measurement technique and the preliminary results obtained during the experimental tests will be presented.